AD-A144 485 HIGH MARANGONINUMBER CONVECTION IN A SQUARE CAVITY; 1/1
ADDITIONAL RESULTS(U) STANFORD UNIV CA CENTER FOR LARGE
SCALE SCIENTIFIC COMPUTATION A ZEBIB ET AL. JUL 84
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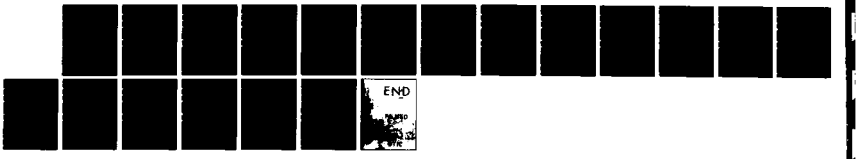

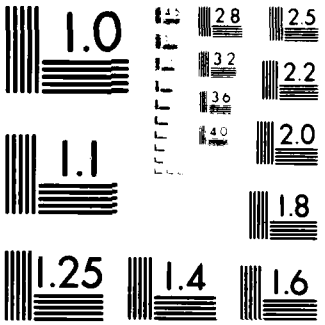

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Report CLaSSiC-84-02

July 1984

High Marangoni Number Convection in a Square Cavity; Additional Results

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21 June 1984

This manuscript is a companion document to the paper "High Marangoni number convection in a square cavity," by the present authors which, at the time of this writing, is submitted for publication in the Journal of Fluid Mechanics. Thus it should only be read in conjunction with the above mentioned paper.

Complete listing of our computational results is provided in Table I. Figures 1 through 5 show the variation with y of the temperature and u-velocity at the plane x = 0. The values of Pr are, respectively, 0.05, 0.1, 1, 10 and 50, while the Re ranges are as indicated in the Figures. For Pr = 10, we also include the variation with x of the surface temperature and velocity in Figures 4a and 4b.

Acknowledgment

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Letter on file

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Table I
Results With The Nonuniform 62x54 Mesh

Pr	Re	Nu_-	Nu_+	$-\psi_{max} \times 10^2$	$-\omega_{max}$
0.05	1×10^3	1.012	1.027	0.877	1.433
	5×10^3	1.147	1.164	0.512	2.941
	1×10^4	1.331	1.315	0.384	4.4xx
	2×10^4	1.606	1.589	0.276	7.2xx
	3.5×10^4	1.901	1.898	0.208	11.10
	5×10^4	2.120	2.131	0.174	14.37
	*5×10^4	2.161	2.151	0.180	14.44
0.1	1×10^3	1.061	1.068	0.816	1.93
	5×10^3	1.374	1.377	0.449	5.31
	1×10^4	1.715	1.696	0.335	8.99
	2×10^4	2.178	2.162	0.248	15.32
	3.5×10^4	2.620	2.630	0.196	22.97
	5×10^4	2.937	2.957	0.168	29.04
	*5×10^4	2.980	2.981	0.175	28.95
1	1×10^3	1.925	1.920	0.479	11.79
	2×10^3	2.470	2.466	0.424	20.20
	3×10^3	2.860	2.852	0.404	26.81
	4×10^3	3.167	3.155	0.384	32.77
	5×10^3	3.420	3.412	0.366	38.37
	6×10^3	3.646	3.633	0.350	43.46
	7×10^3	3.846	3.829	0.337	48.15
	8×10^3	4.027	4.008	0.326	52.50
	9×10^3	4.192	4.169	0.315	56.50
	1×10^4	4.343	4.317	0.305	60.20
10	1×10^3	3.924	3.921	0.240	81.97
	5×10^3	6.979	6.949	0.230	146.3
50	20	1.975	1.966	0.470	12.20
	40	2.425	2.426	0.345	22.87
	60	2.718	2.722	0.290	32.97
	80	2.940	2.944	0.257	42.42
	100	3.122	3.125	0.236	51.19
	120	3.278	3.281	0.221	59.30
	140	3.417	3.419	0.210	66.79
	160	3.542	3.543	0.201	73.71
	180	3.657	3.658	0.194	80.10
	200	3.764	3.764	0.188	86.00
	250	4.013	4.010	0.179	98.87
	500	4.895	4.898	0.155	139.4
	*500	4.894	4.896	0.155	139.7

*Results with the nonuniform 70x60 mesh.

Figure captions

- Figure 1. a) Core temperature corresponding to Pr = 0.05 and Re = 1000, 10,000, 20,000 and 50,000. b) Associated core velocity.

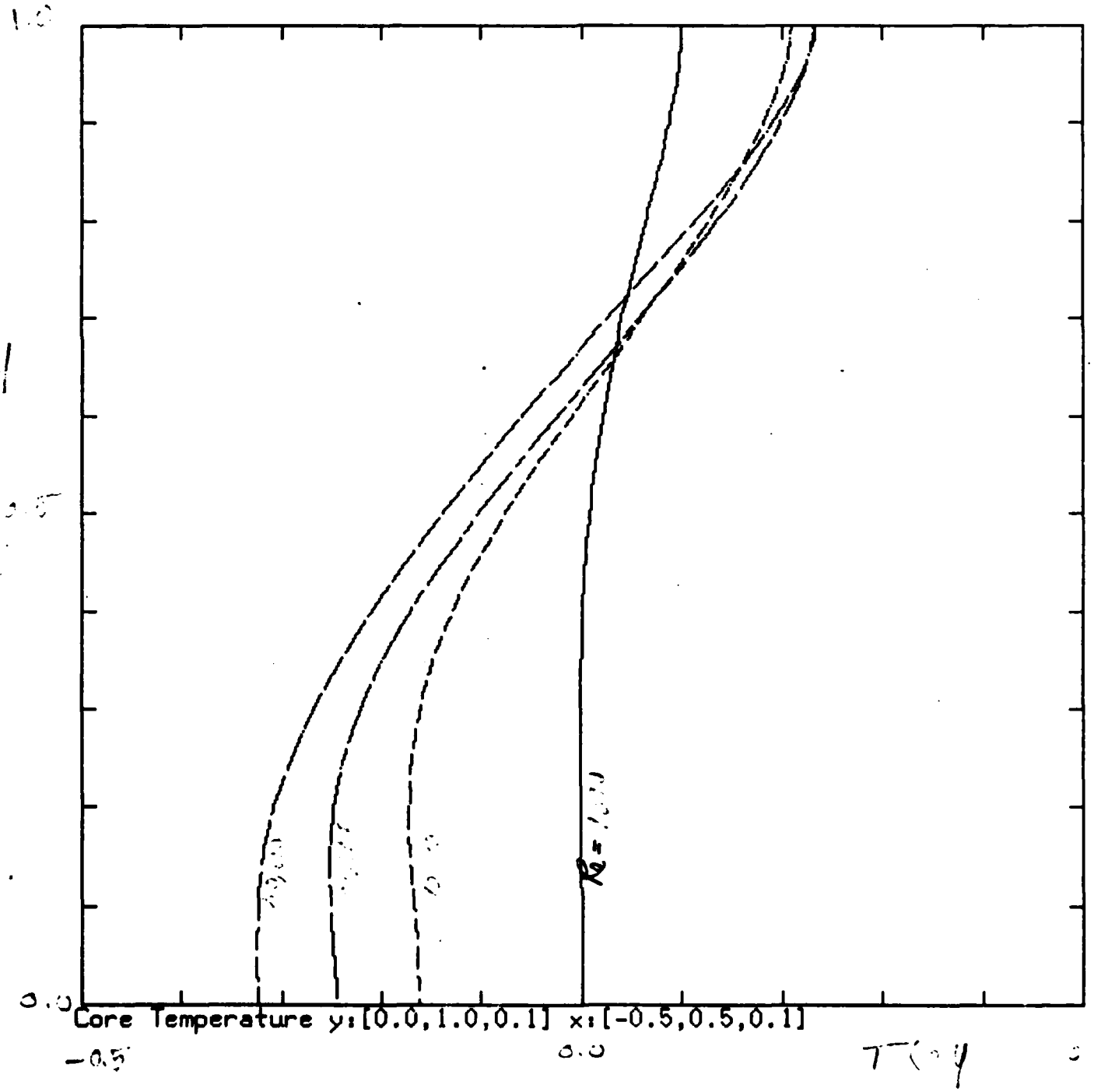
- Figure 2. Same as Figure 1 but with Pr = 0.1.

- Figure 3. a) Core temperature corresponding to Pr = 1 and Re = 1000, 2000, 3000, 4000 and 5000. b) Associated core velocity. c) Core velocity with Pr = 1 but with Re = 1000, 10,000 (mod 1000).

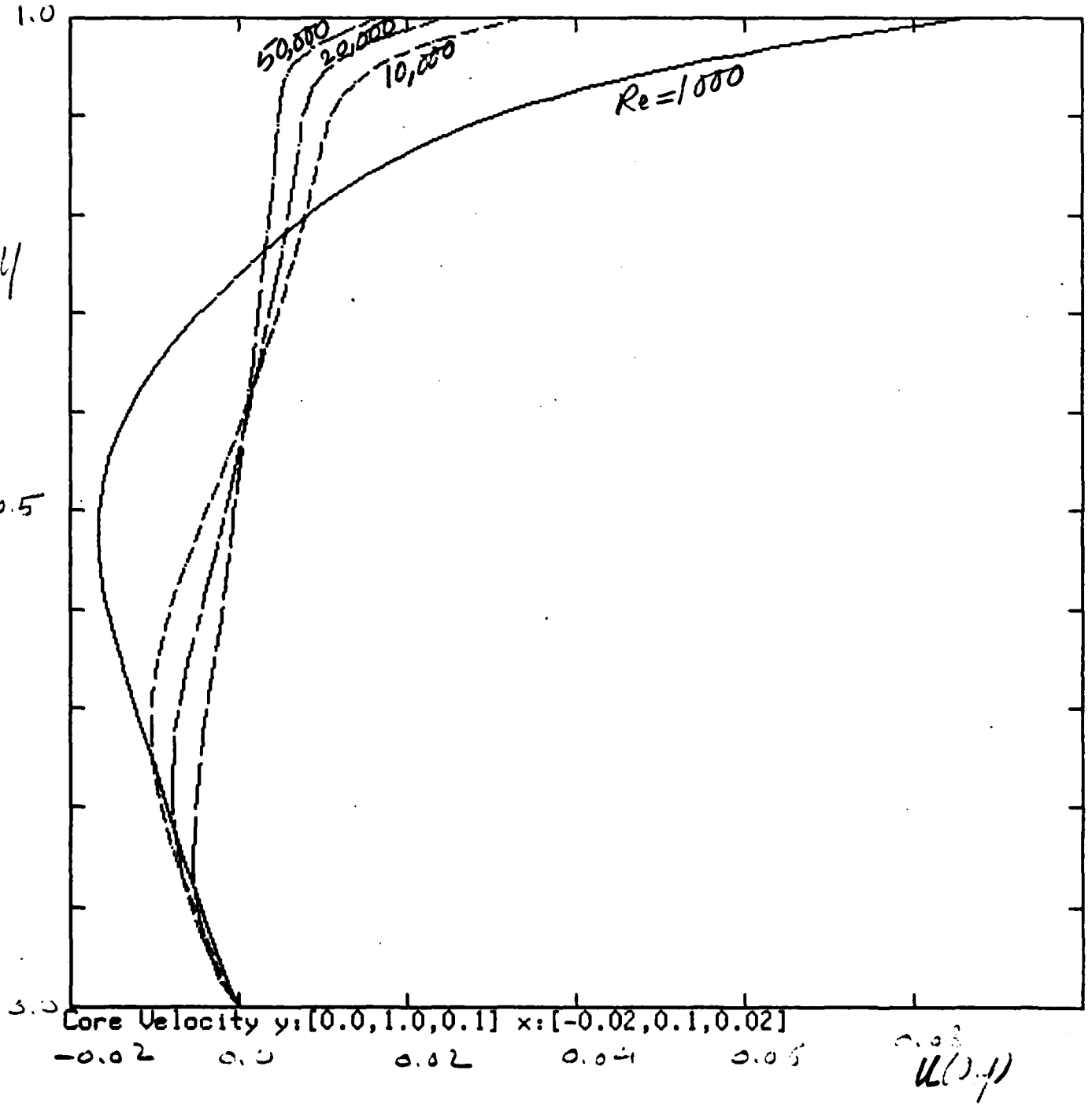
- Figure 4. a) Surface temperature corresponding to Pr = 10 and Re = 1000 and 5000. b) Associated surface velocity, c) Core temperature, d) Core velocity.

- Figure 5. a) Core temperature corresponding to Pr = 50 and Re = 20, 100 (mod 20). b) Associated core velocity but with Re = 20, 200 (mod 20).

$Pr = 0.05$

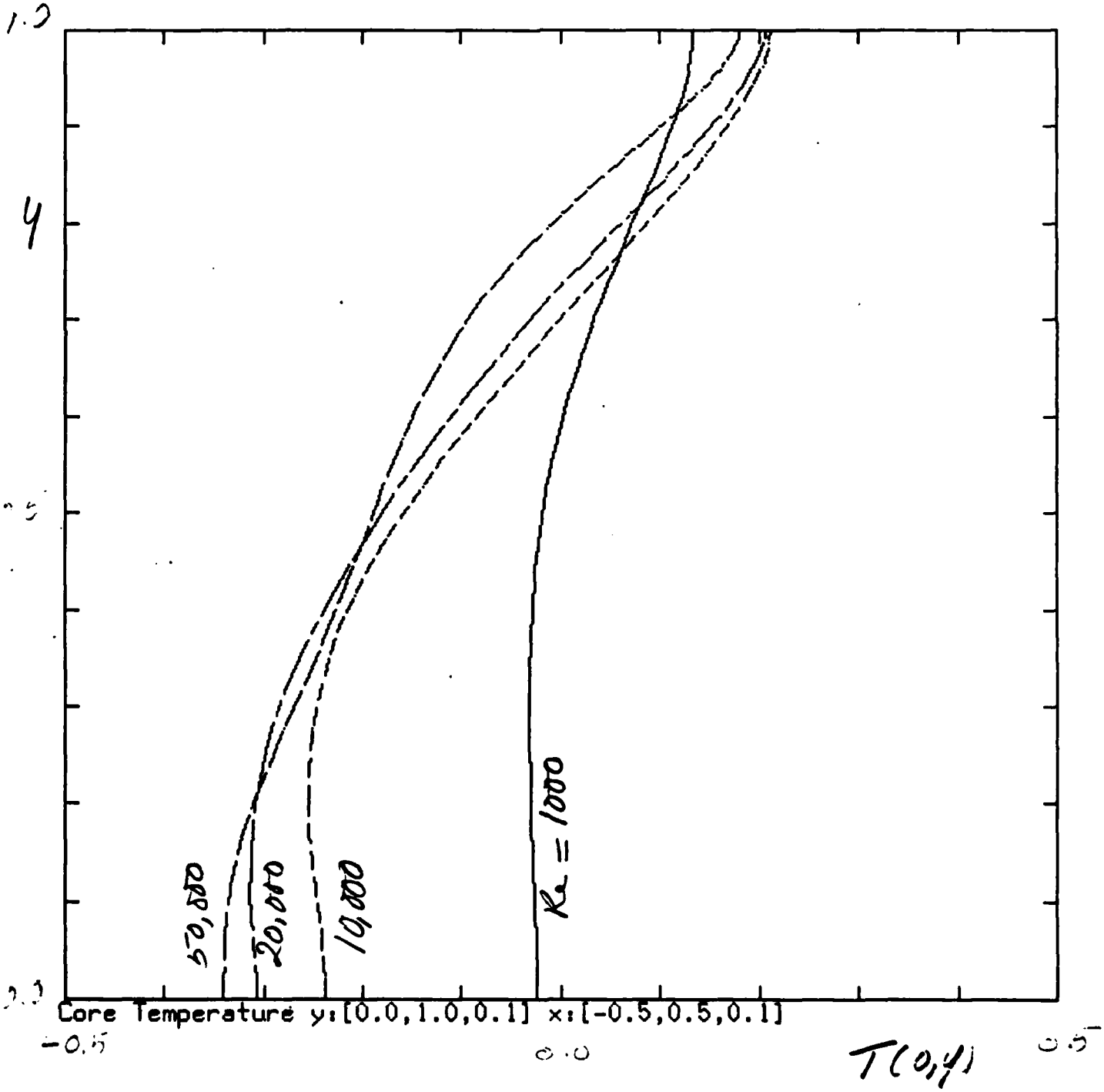


$Pr = 0.05$


1.0
0.5
0.0
y
50,000
20,000
10,000
Re=1000
Core Velocity y:[0.0,1.0,0.1] x:[-0.02,0.1,0.02]
-0.02
0.0
0.02
0.04
0.06
0.08
u(0.1)

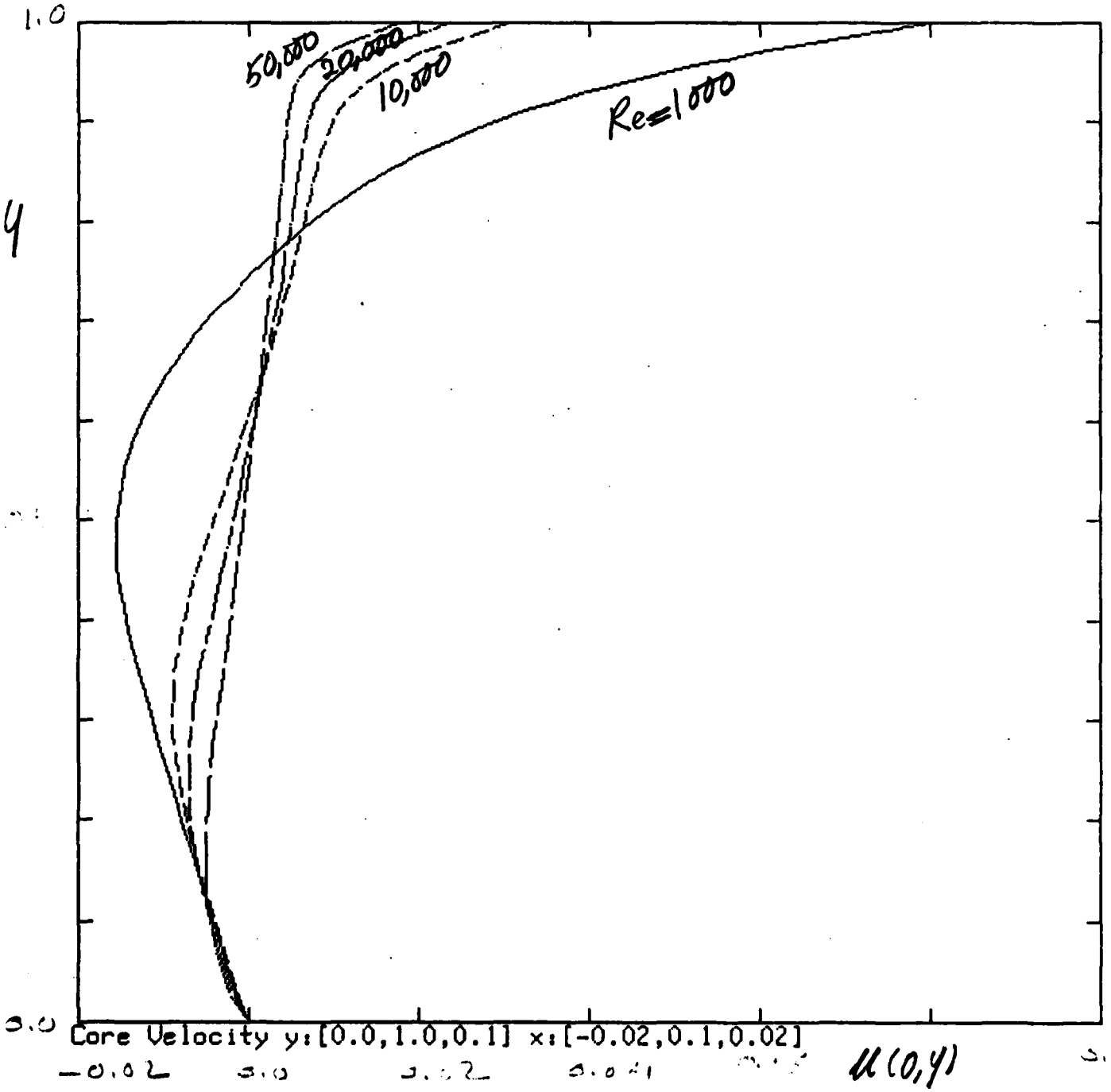
$\gamma_r = 0.1$

$Pr = 0.1$

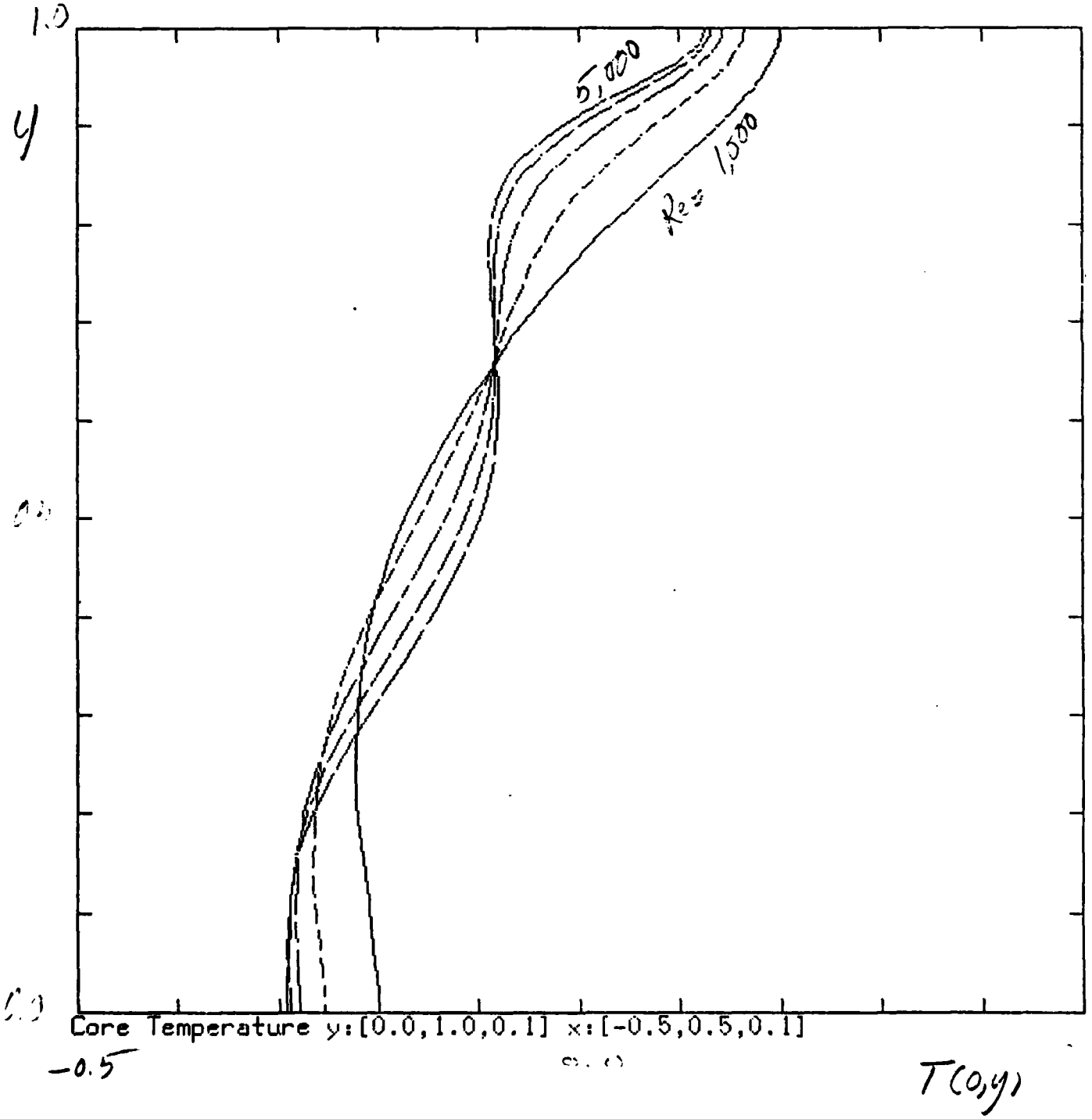


$Pr = 0.1$

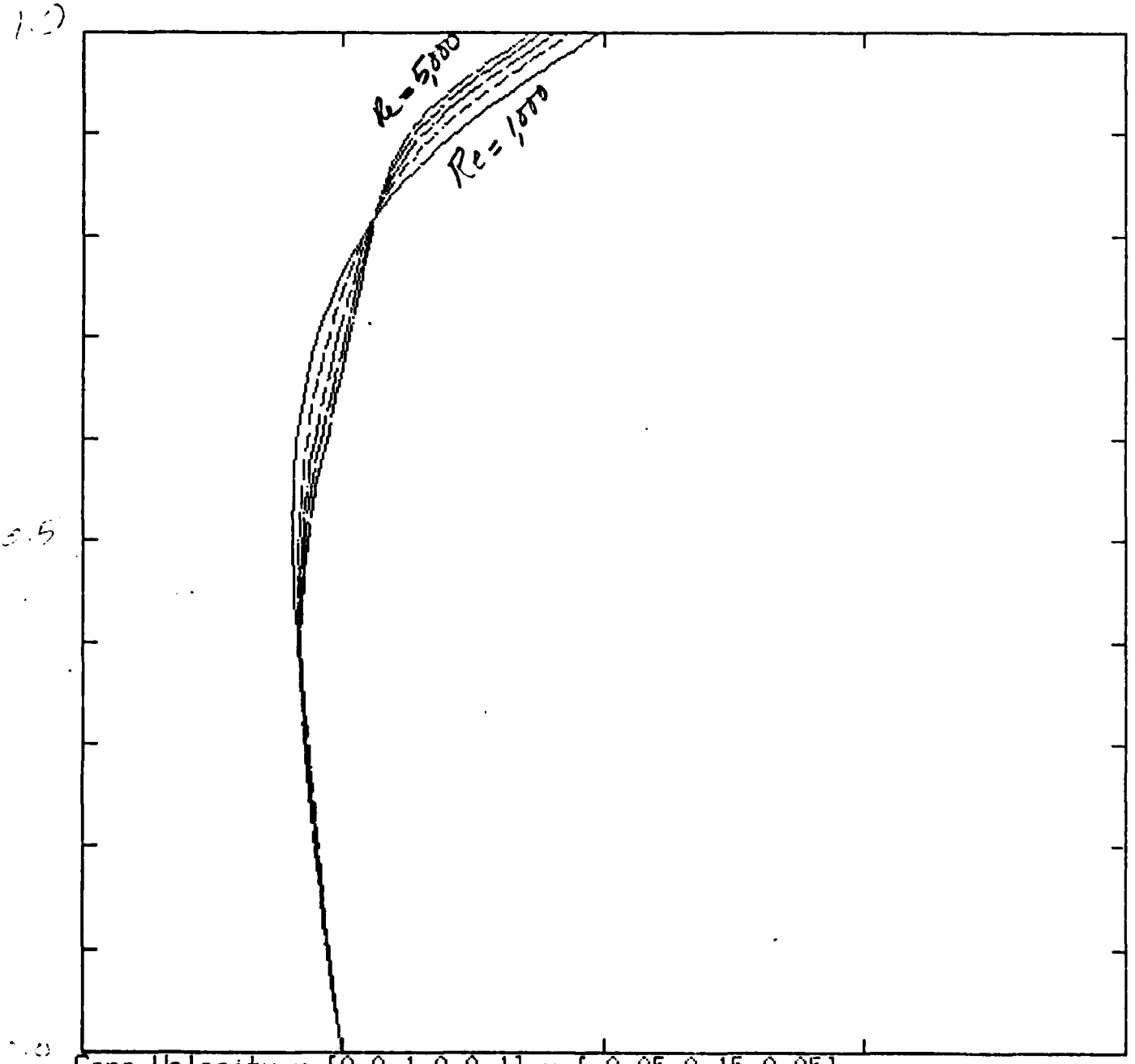
$Pr = 0.1$


1.0
50,000
20,000
10,000
Re=1000
y
0.0
Core Velocity y:[0.0,1.0,0.1] x:[-0.02,0.1,0.02]
-0.02
0.0
0.1
u(0,y)

Pr=1



$Pr = 1$

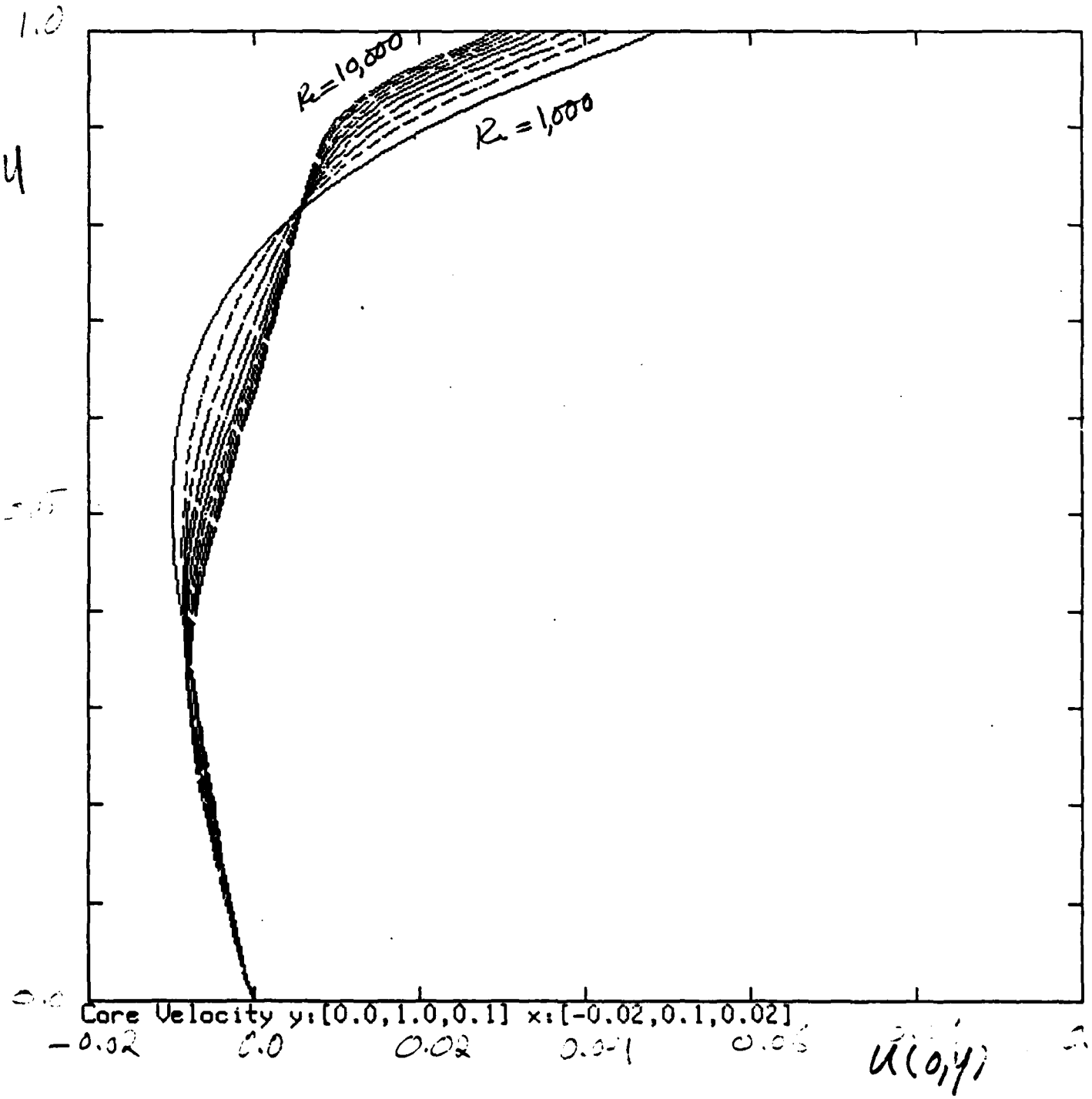

Re=5,000
Re=1,000
Core Velocity y:[0.0,1.0,0.1] x:[-0.05,0.15,0.05]
-0.05
0.0
0.05
0.1
0.15

$u(0,y)$

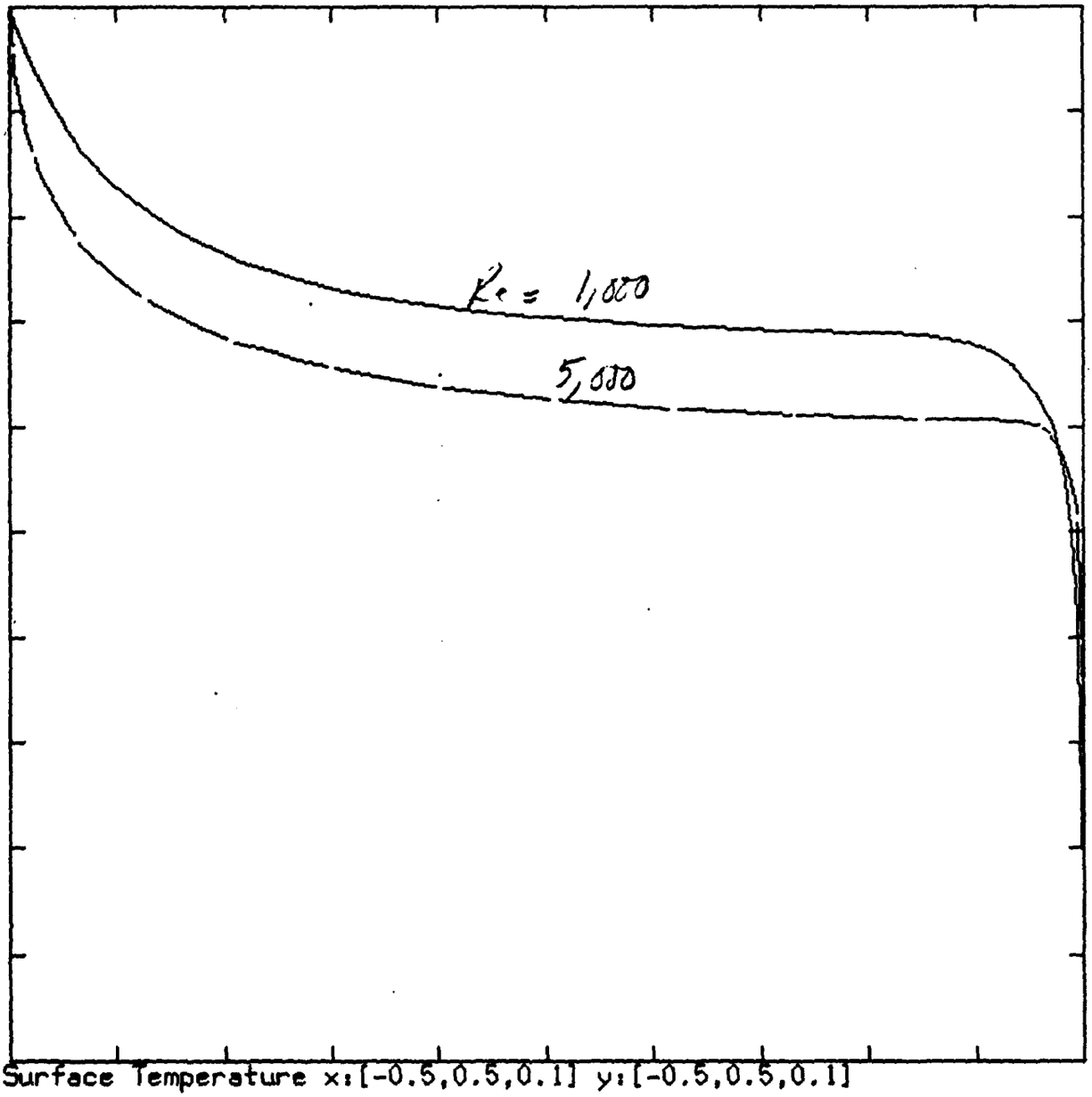
62 × 54

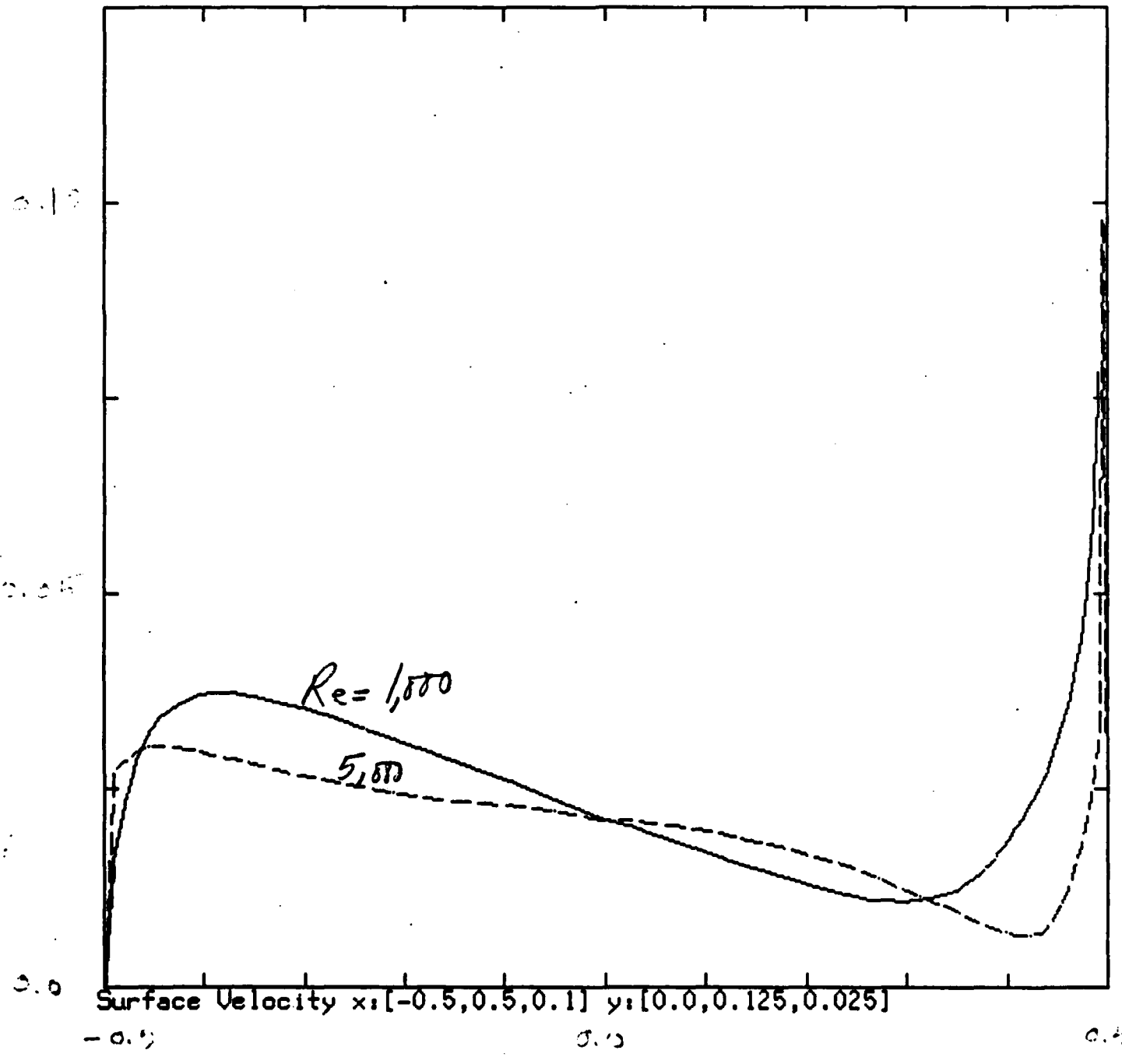
$Pr = 1$

$Pr = 1$


1.0
y
$R_e = 10{,}000$
$R_e = 1{,}000$
Core Velocity y:[0.0,1.0,0.1] x:[-0.02,0.1,0.02]
-0.02
0.0
0.02
0.04
0.06
$u(0,y)$

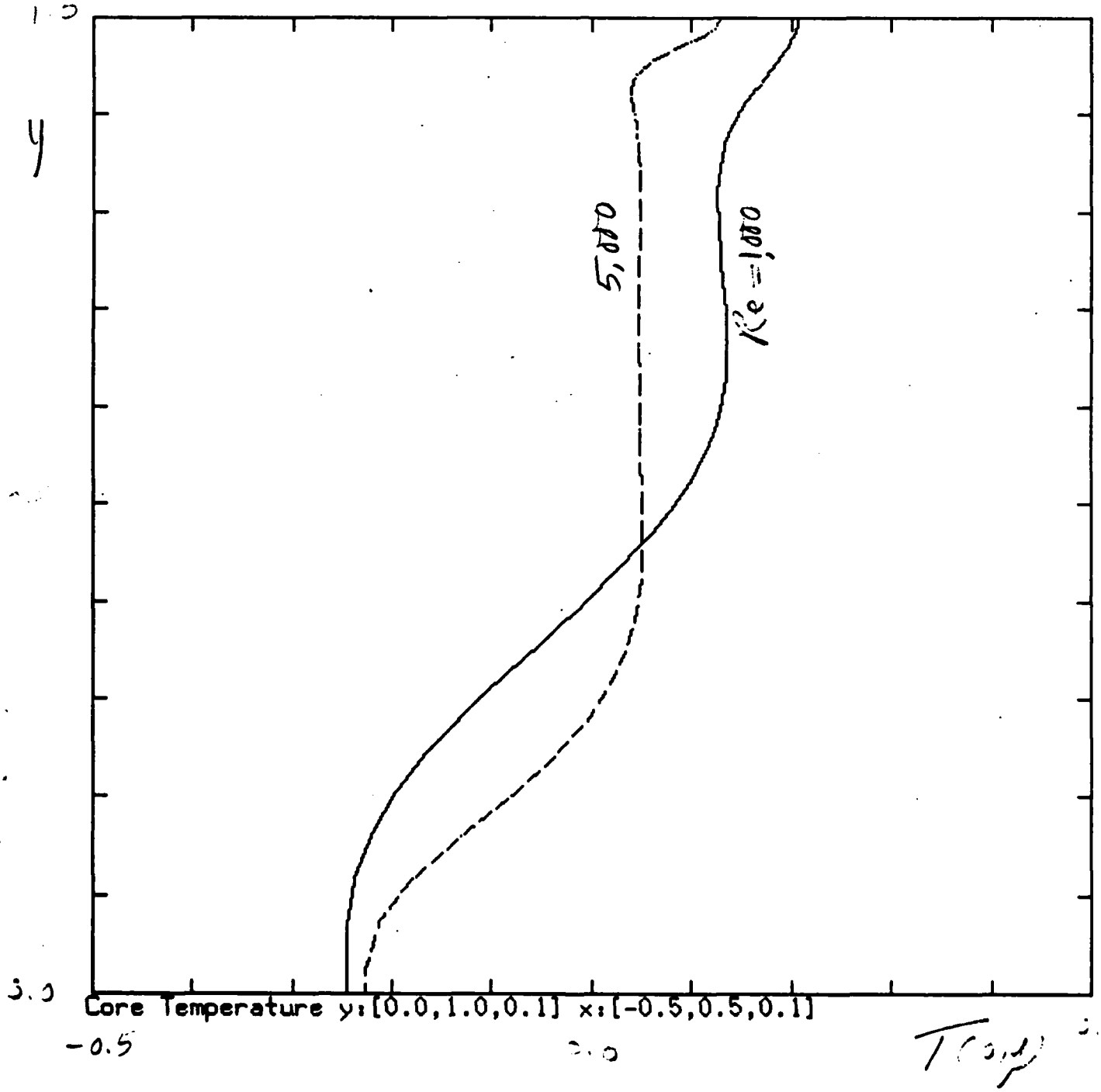
$Pr = 10$


Re = 1,000
5,000
-0.5
Surface Temperature x:[-0.5,0.5,0.1] y:[-0.5,0.5,0.1]
0.5
0.0
-0.5

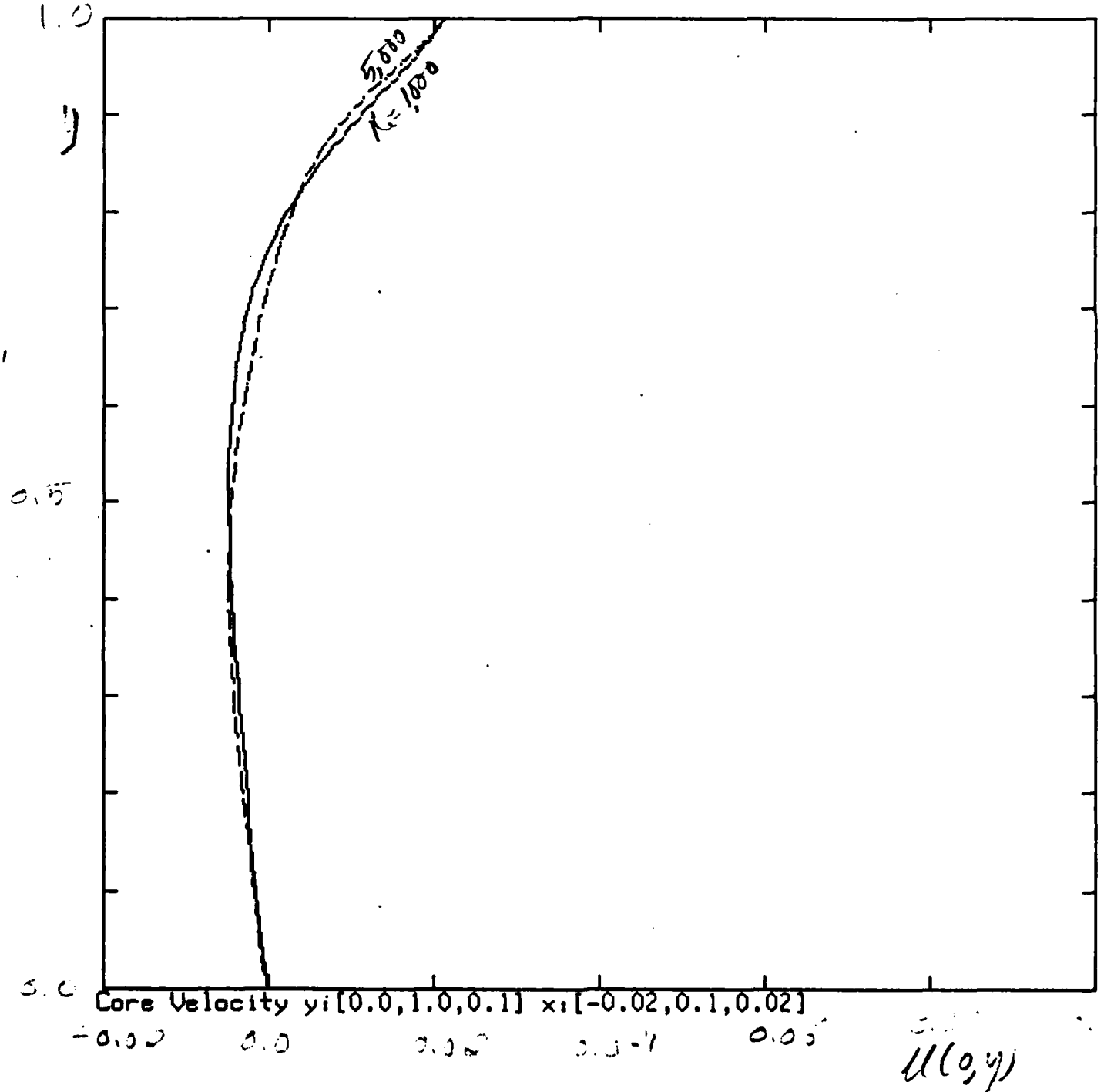

Re= 1,000
5,000
Surface Velocity x:[-0.5,0.5,0.1] y:[0.0,0.125,0.025]

$Pr = 10$

4c

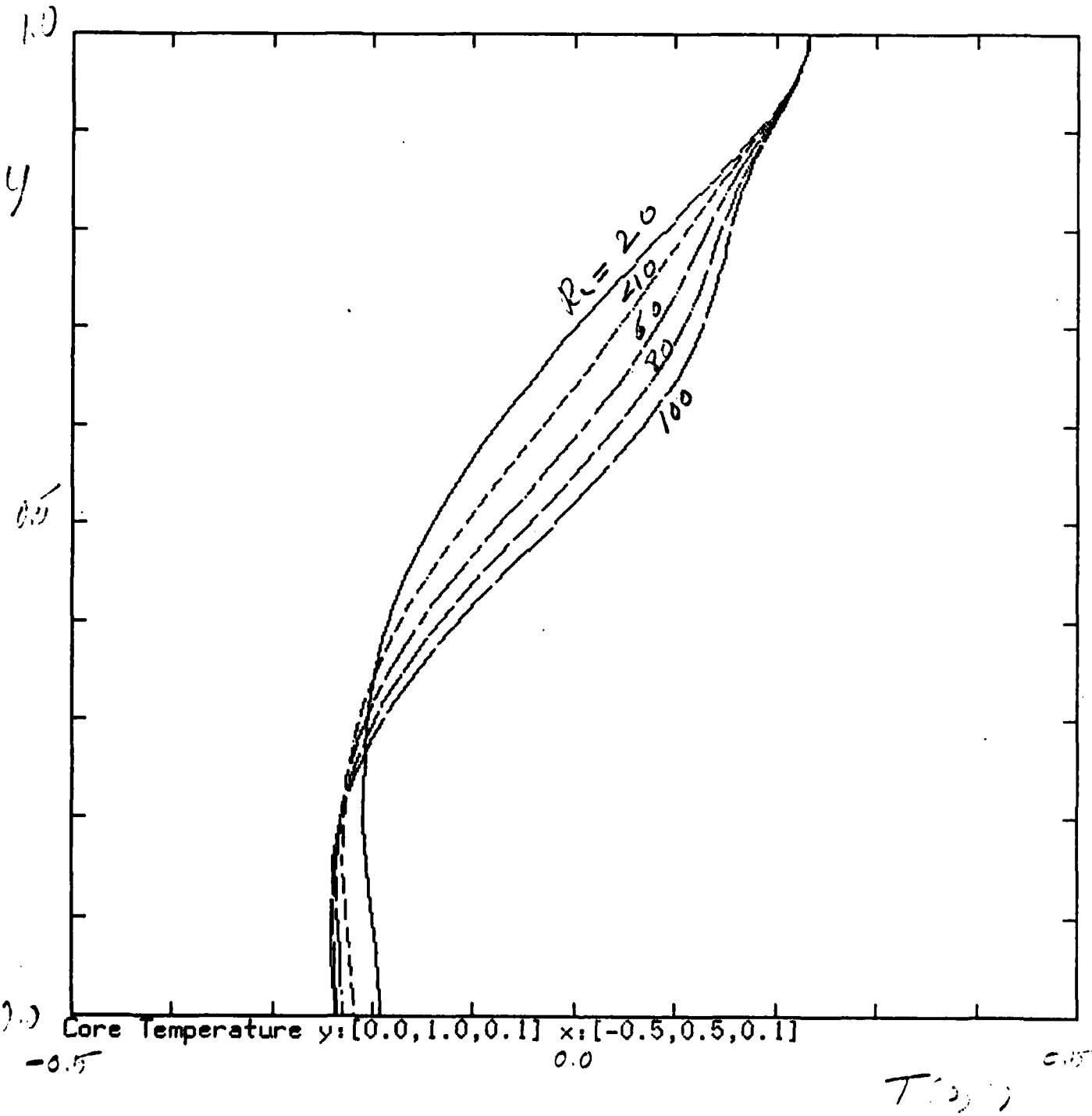


$Pr = 10$


1.0
y
0.5
0.0
5,000
R=1000
Core Velocity yi[0.0,1.0,0.1] xi[-0.02,0.1,0.02]
-0.02
0.0
0.05
u(0,y)

$Pr = 50$

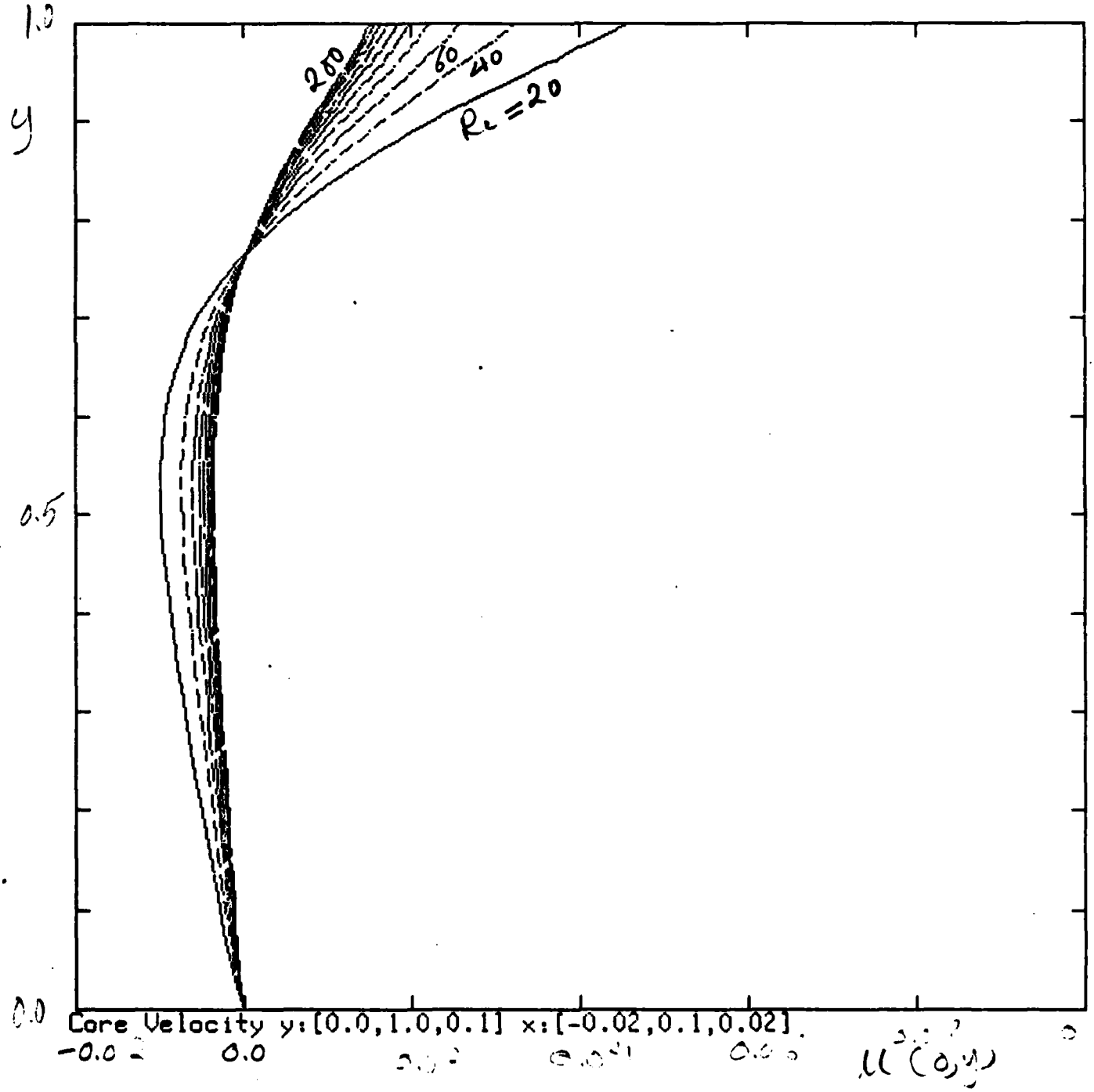
5 cl


1.0
y
0.5
0.0
Ra = 20
40
60
80
100
Core Temperature y:[0.0,1.0,0.1] x:[-0.5,0.5,0.1]
-0.5
0.0

T(x,y)

Pr=50

Re = 20, 40, 60, 80, 100
120, 140, 160, 180, 200



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